Counting Deaths to Saving Lives: Harnessing Mortality and Cause of Death Statistics through Effective Civil Registration and Vital Statistics System in Nigeria

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Abstract
The availability of timely and reliable mortality and cause of death statistics is critical to understanding the levels and distributions of mortality, morbidity, and their causes, and other emerging health threats for evidence-based policy formulation, implementation, and monitoring. However, available estimates in many low- and middle-income countries suggest most deaths go unrecorded and that there is a low medical certification of cause of death by trained physicians. Death registration in Nigeria, with a death rate of 12.4 deaths per 1000 population, is low, while data on medically certified causes of deaths is unavailable. The non-availability of reliable and disaggregated population data is exacerbated in countries like Nigeria with no well-functioning Civil Registration and Vital Statistics (CRVS) systems. Among other population data sources, only a well-functioning CRVS system is essential for quality mortality and cause of death statistics on a continuous and universal basis. The descriptive design was adopted to examine how timely and reliable mortality and cause of death statistics can save lives and benefit Nigeria's public health policies. Therefore, this study describes the prospects of a robust and efficient CRVS system to addressing Nigeria's data quandary by generating mortality and cause of death statistics for evidence-based decision-making. Hence, more attention is required towards scaling up Nigeria's CRVS system to generate timely and reliable population data and harness the same to drive and monitor Nigeria's public health decision-making process.

Keywords: civil registration and vital statistics, mortality, death statistics, population data, Nigeria

Introduction

Anchoring policies on real-time statistics and not just on chance, intuition, and mere guts has become an essential component of good governance in the 21st century. One of such statistics necessary for effective health policy planning is the mortality and cause of death statistics. They are the disaggregated number of deaths recorded in a particular area for a specific period and all diseases, morbid conditions, or injuries that either lead or contribute to death (Mikkelsen, Richards & Lopez, 2018). Their availability, accuracy, and timeliness are fundamental in explaining trends and disparities in mortality, identifying emerging disease patterns, and informing health-related interventions.

Understanding the prevailing health trends and their drivers, numbers of people dying, and the underlying causes of these deaths afford authorities the chance of saving more lives in the future through research, epidemiological interventions, and allocation of needed resources to health systems (Nshimiyimana, 2018). However, to save lives by counting deaths and their underlying causes, mortality and cause of death statistics must be available, complete, timely, reliable, and disaggregated by age, sex, places of occurrence, and their causes (Thomas, D'Ambruoso & Balabanova, 2018). Otherwise, policies derived thereof could be obsolete and without many

positives for citizen's health outcomes (Ukoji, Okoronkwo, Imo & Mbah, 2019; Bloomberg Philanthropies Data for Health Initiative, 2018).

Notwithstanding their usefulness, generating reliable and timely mortality and cause of death statistics in many low- and middle-income countries remains a big challenge. The robustness of the process through which they are generated is critical to their quality and policy value (Cobos Muñoz, de Savigny, Sorchik, Sandar, Hart & Kwa *et al,* 2018). In most countries without advanced statistical systems, many deaths go unreported (World Health Organisation [WHO], 2014) and may not be disaggregated according to WHO requirements- by sex, age, time of occurrence, and causes (Hill, Lopez, Shibuya & Jha, 2007). Additionally, most deaths in many low- and middle-income countries take place at homes and in remote hamlets, where trained physicians are in short supply. Consequently, less than a third of deaths the world over are assigned specific causes (de Savigny, Riley, Chandramohan, Odhiambo, Nichols & Notzon *et al*, 2017).

In Nigeria, death registration still ranks very low, with a completeness rate at 10% as of 2017, while data on medical certification of causes of deaths is unavailable (Centre of Excellence for Civil Registration and Vital Statistics Systems, 2019; United Nations, 2018; United Nations, 2017; Tobin, Obi & Isah, 2013). Only 21 out of 36 states, including the Federal Capital Territory, could supply records of deaths between 2014 and 2016 without any underlying causes (National Bureau of Statistics, 2018). This lack of mortality and cause of death statistics is linked to poor attitudes on the part of citizens and inadequate government funding of Civil Registration and Vital Statistics (CRVS) system programs across many states in Nigeria (Ukoji *et al,* 2019; Centre of Excellence for Civil Registration and Vital Statistics Systems, 2019; Tobin *et al,* 2013; Akande & Sekoni, 2003).

The CRVS system refers to the recording and publishing of vital events, such as births, deaths, causes of deaths, etc. on a continuous, permanent, compulsory, and universal basis in line with the local laws of a particular country (World Bank, 2017; United Nations Statistics Division, 2014). The CRVS system, among other sources of population data, has the best prospects for generating complete and reliable mortality and cause of death statistics (World Bank/WHO, 2014). The non-performing CRVS system and the unavailability of mortality and cause of death statistics suggest that Nigeria's public health policy relevance is limited. Therefore, it is evident that Nigeria has a data challenge and lacks the most fundamental elements to inform evidence-based health policy interventions. Hence, this paper explored the prospects of generating continuous, reliable, and timely mortality and cause of death statistics through an efficient CRVS system and harnessing the same to save lives in Nigeria.

Conceptual Discourse

Mortality: Demographers use mortality as a concept to express the pattern of deaths that occur within a given population (Weeks, 2008). To a large extent, mortality patterns depict the level and quality of life in a population. In this case, the healthier a population is, the more that population is likely to experience less mortality, while populations with high morbidity experience high mortality. Mortality in all known populations is not randomly distributed as the pattern of death differs by age and sex. In this case, the very young and the very old sub-sets of the population are more vulnerable to death than young adults (Weeks, 2008). The reasons for the age differences in mortality are obvious. Younger children are more likely than young adults to die in their early years of life due to their poorly developed immune system, various cultural practices that surround childrearing and household socioeconomic contexts (Population Reference Bureau, 2003).

Mortality drops drastically among young adults and then peaks among older populations who are likely to develop chronic health conditions, including diabetes, hypertension and other heart diseases, etc. The deaths among these group of the population are somewhat inevitable regardless of the level of development of a country.

Aside from the age differentials in mortality, there are other social, cultural, economic, biological factors among others that affect mortality patterns. Generally, women are known to outlive men and this has been attributed to some kind of basic biological superiority that females have over their male cohorts. This biological superiority that allows women to survive more than men is regarded as sexual dimorphism (Weeks, 2008). In some places, this biological superiority does not follow and implies that in such societies, men outlive women or at the least both sexes have similar life expectancy. This has been attributed to certain social factors such as the domination and status of women, and other lifestyle behaviours such as smoking among other behaviours.

To understand the extent to which people are unable to live to their biological maximum age, population scientists adopt several tools to measure mortality. The success at which the force of mortality is measured depends on the particular tool adopted. These major tools for measuring mortality are the crude death rate and age/sex-specific death rates. The crude death rate is the simplest measure of mortality. It is defined as the total number of deaths in a specified time period divided by the number of population and multiplied by 1000 (Population Reference Bureau, 2003). Regardless of the simplicity of the crude death rate, it is not a very effective tool in measuring mortality patterns due to its inability to account for mortality differentials by age and sex. Therefore, the age/sex-specific death rate captures the risk of dying with interest in age and sex distribution within the population. The age-specific death rate is measured by dividing the number deaths of people in a particular age group or sex by the total number of people in that particular age group or sex and multiplied by 1000 (Weeks, 2008).

Civil Registration and Vital Statistics: According to the United Nations Statistics Division civil registration is the compulsory, continuous, permanent, and universal recording of the occurrence and characteristics of vital events that relate to the population and in line with the laws of a particular country (United Nations Statistics Division, 2014). On the other hand, vital statistics refers to the collection and description of vital event statistics in a person's lifetime (World Bank, 2017). Using an effective civil registration and vital statistics system, vital events such births, deaths, cause of deaths, marriages and divorces are recorded on a continuous basis. These records are analysed and the resulting statistics inform national policies and the decision-making process (Ukoji *et al,* 2019).

Methodology

This study adopted the descriptive method to depict Nigeria's data quandary and described how an effective CRVS system could provide an opportunity to generate population-based statistics for evidence-based decision making. The paper sourced resources from online databases and thereafter conducted a desk review of existing literature, including empirical studies, reports and evaluations by regional and international bodies. Materials involved in the desk review were between 2003-2020 with primary focus on how mortality and cause of death statistics could be sourced through an effective CRVS system and used to save more lives through evidenced-based decision making.

The CRVS System, Nigeria's mortality and Cause of Death Statistics

A 2018 evaluation of Nigeria's CRVS system capacity found it could not produce mortality and cause of death statistics for measuring and monitoring Nigeria's progress towards achieving the United Nations sustainable development goals (Maduekwe, Banjo & Sangodapo, 2018). Nigeria's lack of capacity in CRVS is evident in its low Vital Statistics Performance Index (VSPI). Between 2005 and 2012, Nigeria achieved a <0.07 score of VSPI (Bloomberg Philanthropies Data for Health Initiative, 2018). The VSPI measures the capacity of CRVS systems to accurately and completely capture and certify vital events such as deaths and their underlying causes. On this note, Nigeria's CRVS system performed poorly in three components: registration completeness, cause of death details, and data quality (Ukoji *et al,* 2019).

Nigeria's CRVS system lacks efficiency and robustness and thereby incapable of producing high-quality vital statistics. Cobos Muñoz et al. attributed this to technical and systemic challenges other than those faced by high-income countries (Cobos *et al,* 2020). Additionally, the CRVS system is a complex adaptive system involving different stakeholders with different functions working together to achieve harmonized goals (Cobos, Abouzahr & de Savigny, 2018). Herein lies the challenge of poor performance of CRVS systems in Nigeria; and therefore requires a well-thought-out process to produce actionable mortality and cause of death data for evidence-based health intervention programs. Hence, in the face of Nigeria's data challenge, harnessing mortality and cause of death statistics through an effective CRVS system could ensure effective policy formulation to save lives.

Several efforts are currently ongoing by national governments, international agencies, and philanthropist organisations to scale up CRVS systems in most low- and middle-income countries, including Nigeria (Bloomberg Philanthropies Data for Health Initiative, 2018; Lopez and Setel, 2015; World Bank/WHO, 2014). With help from international development partners, Nigeria is presently digitizing its CRVS ecosystem and implementing the use of Verbal Autopsy (VA), a systematic procedure used in ascertaining probable causes of death occurring outside healthcare facilities (Centre of Excellence for Civil Registration and Vital Statistics Systems, 2019). Aside from national efforts at scaling up CRVS systems performance, there have also been commendable efforts at the continental level. One of those efforts is the Africa Program on Accelerated Improvement of Civil Registration and Vital Statistics (APAI-CRVS), coordinated by the African Union Commission (African Union Commission, 2015). This program seeks to provide a policy framework for scaling up CRVS systems on the African continent, where member countries are required to take a holistic assessment of their CRVS systems and draw national plans for improvements.

Nigeria's data quandary: Efficient CRVS System to the rescue

Effective public health planning across the world is driven by accurate and timely data on mortality patterns and their leading causes. The cause of death statistics has been described as the most fundamental piece of public health information, and therefore death records and their underlying causes need to be complete, accurate, and prompt (Izegbu, Agboola, Shittu & Akiode, 2006). Unfortunately, in Nigeria, it is safe to say that most mortality and cause of death data that should drive public health interventions are lacking. Where available, they are seriously compromised by lack of completeness, accuracy, and promptness. For instance, Nigeria has been unable to conduct another round of population census following the last one in 2006. Even the results of the previously conducted population censuses have been fraught with controversies, with many

commentators noting that the figures are inaccurate for meaningful policy formulation (Ukoji *et al,* 2019).

Undoubtedly, Nigeria faces data challenges given the paucity of mortality and cause of death statistics from the lack of robust mechanisms for collecting continuous and accurate population data. Unfortunately, Nigeria's present CRVS ecosystem remains below par. Therefore, it lacks efficient solutions to the pervasive data challenge in the country. However, an effective CRVS system will provide profound prospects for overcoming Nigeria's data quandary. Therefore, Nigeria must find the political will to scale up its CRVS system. This is especially true given that only a well-functioning CRVS system can effectively tackle the health and development challenges of decades ahead with accurate data of deaths and their causes (AbouZahr *et al,* 2015). Therefore, Nigeria should consider prioritizing a well-functioning CRVS system to ensure continuous, prompt, and accurate mortality and cause of death statistics that could lead to evidence-based public health decision-making. The prospects of the CRVS in solving Nigeria's data quandary are illustrated below.

Between 2006 and 2020, the Nigerian government has formulated and implemented several public health interventions and policies that require reliable and accurate data. This scenario makes the formulation of health intervention policies based on estimates and outdated data inevitable, with dire consequences for population health outcomes. Of course, other sources of demographic data, including the Nigeria Demographic and Health Survey (NDHS), Nigeria Multiple Indicator Cluster Survey [MICS], and the Nigerian General Household Panel Survey [NGHPS], generate population data periodically, usually in four-year intervals or more. Conversely, the CRVS system produces disaggregated demographic data continuously that could be accessed at any time and for any state or region. Such mortality and cause of death data are collected simultaneously across the country and can be effectively compared across board. Such is the strength of the CRVS in producing mortality and cause of death statistics that the government should prioritize it. Hence, it is only a well-functioning CRVS system in Nigeria that is most appropriate to provide universal, accurate, prompt, and complete mortality and cause of death statistics for evidence-based decision-making to save lives.

Setting up a robust and effective CRVS system with trained staff well versed in the International Classification of Diseases (ICD) to generate both mortality and cause of death statistics should be a national emergency. This is especially true as there have been evidences of misclassification of causes of death in hospitals. Such errors usually result from physicians' lack of time, incentives, diagnostic facilities, correct knowledge of the International Classification of Diseases (ICD), and the understanding that accurate diagnoses of cause of death statistics impact national policy formulation (Rampatige, Mikkelsen, Hernandez, Rileya & Lopez, 2014). Further, most medical records departments in charge of coding causes of death are usually understaffed and lack statistical competence to ensure data quality. Additionally, the practice of depending on hospitals for mortality and cause of death statistics is not working. In Nigeria, available counts of deaths are usually supplied by hospitals (National Bureau of Statistics, 2018). Death records supplied by various State Ministries of Health are mostly incomplete. In these circumstances, an effective CRVS system in Nigeria comes in very handy as a well-functioning CRVS system ensures higher completion of death registration added to better cause of death information.

About two-thirds of deaths in many low- and middle-income countries occur outside healthcare facilities (Jackson, Wenz, Muniz, Abouzahr, Schmider & Martin, 2018). Hence, these deaths and

their causes are not captured in Nigeria's dysfunctional Health Information Systems (HIS) and are unlikely to be factored in when policy interventions are made. However, there is an opportunity for a well-functioning CRVS system to capture a wide range of deaths taking place in communities and outside healthcare facilities. This is possible given that CRVS registration centres are located in various Local Governments Authorities and communities. In cases where notification, registration, and medical certification of causes of death prove difficult due to remoteness and topography, the use of technologies such as telecom SMS can prove efficient. Additionally, the Verbal Autopsy (VA), a procedure whereby the dead persons' relatives are interviewed to ascertain the probable cause of death can be integrated into the CRVS system.

While striving towards meeting the UN sustainable development goals, nations need to monitor their progress consistently. Consistent monitoring avails the opportunity to see whether or not their efforts are yielding the required results. For this purpose, timely, accurate, and reliable fertility, mortality, and cause of death data are required. Twelve out of the 17 SDGs (Goals1, 2, 3, 4, 5, 8, 9, 10, 11, 12, 16 and17) and 67 of the 230 indications can be best measured with data from well-functioning CRVS systems. For instance, SDG Targets 3.1, 3.2, 3.3, 3.4, 3.6, 3.9, 11.5, and 16.1 all require mortality and cause of death statistics to be effectively measured (Samuel, Abouzahr, Kim, Rassekh & Sarpong, 2017). This implies that effective monitoring of Nigeria's SDG progress requires complete and accurate mortality and cause of death statistics from a robust CRVS system. Hence, the government should prioritize an efficient CRVS system for accurate and timely mortality and cause of death statistics.

One reason for Nigeria's inability to maintain and operate a robust population database is the lack of funds. To this effect, an effective and well-functioning CRVS system will offer many prospects in addressing Nigeria's data challenge, given its comparative cost advantage over other population data sources. The CRVS system is geographically and administratively structured to reach remote hamlets, therefore collecting mortality and cause of death statistics becomes a by-product of a pre-existing registration system. The implication is cost-effectiveness, where extra cost need not be expended right from scratch.

Understanding the prospects of the CRVS system in harnessing mortality and cause of death statistics

One fundamental source of mortality and cause of death statistics is the CRVS system. The unique strength of the CRVS system in collecting mortality and cause of death statistics is documented in the CRVS literature. Hence, AbouZahr and colleagues acknowledged that the CRVS system is unique and offers far more in collecting mortality and cause of death data than other sources of data because they collect continuously. They observed that the CRVS system deepens individual rights, equity, and accountability, and these benefits are unmatched by other data sources (AbouZahr, de Savigny, Mikkelsen, Setel, Lozano & Nichols, 2015).

Similarly, the superiority of the CRVS system over other sources has been further buttressed. Brolan et al. observed that the continuity, completeness, and timeliness of data are the strengths that set the CRVS system apart from other sources of population data (Brolan, Gouda, AbouZahr & Lopez, 2017). The Health Metrics Network has also noted that through using the CRVS, mortalities can be monitored as they occur while ongoing statistics can be produced, unlike with sample surveys that usually take place at intervals (Health Metrics Network, 2012). Hence, a well-functioning CRVS system has the capability of producing yearly mortality and cause of death patterns at any given time.

The CRVS system also collects mortality and cause of death statistics that are consistent and comparable over time and across places (WHO, 2010). This is especially true because data resulting from the CRVS system is less encumbered by sampling errors associated with other mortality and cause of death statistics sources. Besides, according to the Health Metrics Network, the CRVS system is predicated on standardized definitions of vital events that are applied across the board (Health Metrics Network, 2012). For instance, the causes of death are internationally defined in the International Statistical Classification of Diseases and Related Health Problems (ICD).

Alongside the afore-stated prospects associated with the CRVS system in generating mortality and cause of death statistics is its comparative cost advantage. For instance, the Health Metrics Network opined that the CRVS system could be cost-effective in producing cause of death statistics (Health Metrics Network, 2012). This is because the ensuing mortality and cause of death statistic is merely a by-product of an already existing administrative and legal registration system. In this regard, prominent resources need not be expended from scratch while collecting mortality and cause of death statistics, unlike in a sample survey.

Conclusion

This studyr has highlighted the dire data challenge confronting Nigeria. A component of Nigeria's data challenge is the dearth of mortality and cause of death statistics, which plays an invaluable role in robust health policy interventions and implementation. The unavailability of complete, timely, and accurate statistics on death and its causes implies that Nigeria does not have the actual numbers of people dying and why they are dying. This development hampers the evidence-based decision-making process. This paper has also established that the CRVS system has enormous prospects in bridging the mortality and cause of death data challenges. Aside from its various uses, a well-functioning CRVS system offers the prospect of generating mortality and cause of death statistics on a continuous, permanent, universal, and compulsory basis, a prospect that no other source of demographic data offers.

However, Nigeria's CRVS system remains ineffective and a paradox in generating accurate and timely mortality and cause of death statistics. The CRVS system has suffered from inadequate funding over the years. Perhaps, this explains why Nigeria has a low death registration rate and why only 21 out of 36 states, including the FCT was able to report on the number of deaths between 2014 and 2016 (National Bureau of Statistics, 2018). This inadequate government attention towards Nigeria's CRVS system may have informed the general public's apathy and nonchalance towards the registration of deaths, especially those occurring outside healthcare facilities.

Recommendations

i. Due to the many prospects attributed to the CRVS in generating continuous, complete, prompt, and permanent mortality and cause of death statistics for evidence-based decision making, government needs to prioritize scaling up Nigeria's CRVS system. A holistic assessment of the entire CRVS ecosystem is necessary. Such assessment is possible by employing the process mapping framework to ascertain the lows of the CRVS ecosystem and the required solutions.

ii. Additionally, adequate funding needs to be provided to revamp the entire CRVS ecosystem, particularly by migrating from a paper-based CRVS ecosystem to a digital ecosystem.

iii. Again, it is common knowledge that the government has entered into several partnerships with international multilateral agencies such as the World Bank, UNICEF, and other continental bodies. These partnerships are good. However, the government must own up the ongoing efforts and not take a lackadaisical posturing while scaling up the CRVS performance.

iv. Moreover, a systematic integration of the verbal autopsy into the CRVS system should be pursued to capture the numerous deaths occurring outside healthcare facilities.

v. Above all, premium needs to be placed on using CRVS data to drive policy interventions, whether at the formulation, implementation or monitoring levels. It is only through this process that the prospects of a well-functioning CRVS system can be taken seriously and harnessed to save lives.

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